REMARKS

Applicants request favorable reconsideration and allowance of the subject application in view of the preceding amendments and the following remarks.

Claims 7 through 14 having been indicated as allowable, Claims 1-6, 15 and 20 are now presented for examination. Withdrawn Claim 20 has been cancelled without prejudice or disclaimer of subject matter. Claims 1-3 and 6 have been amended to define still more clearly what Applicants regard as their invention, in terms which distinguish over the art of record. Claim 1 is the only independent claim under consideration.

Claims 1-6 and 15 have been rejected under 35 U.S.C. § 103(a) as unpatentable over U.S. Patent 5,973,332 (Muraki et al.) and U.S. Patent 5,863,682 (Abe et al.). With regard to the claims as currently amended, this rejection is respectfully traversed.

Independent Claim 1 as currently amended is directed to charged particle beam exposure apparatus that draws a pattern on an object to be exposed by irradiating plural charged particle beams on the object based on drawing data. In the apparatus, a storage device stores standard data representing irradiation duty of each of the plural charged particle beams on each of the irradiation positions on the object depending on the pattern, plural pieces of proximity effect correction data to reduce the influence of the proximity effect, and calibration data to reduce irradiation dose variations among the plural charged particle beams. A computing device corrects the standard data by one piece of proximity effect correction data selected from the plural pieces of proximity effect correction data according to a condition of the object on each of the irradiation positions. The irradiation duty of each of the plural charged particle beams is

calibrated by the calibration data to generate the drawing data.

In Applicants' view, Muraki et al. discloses an electron beam exposure apparatus which minimizes the influence of the space charge effect and aberrations of a reduction electron optical system, and simultaneously, increases the exposure area which can be exposed at once to increase throughput. The electron beam exposure apparatus has a source for emitting an electron beam and a reduction electron optical system to reduce and project, on a target exposure surface, an image of the source. A correction electron optical system is arranged between the source and the reduction electron optical system to form plural intermediate images of the source along a direction perpendicular to the optical axis of the reduction electron optical system and corrects in advance aberrations generated when the intermediate images are reduced and projected on the target exposure surface by the reduction electron optical system.

In Applicants' opinion, Abe et al. relates to a charged particle beam writing method to determine an optimal exposure dose for each position in a pattern to be drawn on a target before actually drawing the pattern by irradiating the target with charged particles and drawing the pattern with the obtained optimal exposure doses. According to the method, a first approximate exposure dose is determined for each position on the target. A second optimal exposure dose for each position on the target is determined by determining a corrective value to correct the first approximate exposure dose obtained by multiplying the error in the exposure dose of the position produced when exposed to said first approximate optimal exposure dose by a regulation coefficient of a value substantially equal to the exposure dose to back scattering charged particles and adding said corrective value to said first approximate optimal exposure dose. The exposure

dose is variable as a function of the location of the position. One of the second optimal expose dose determinations for each position is repeated a predetermined number of times until each of the second approximate optimal exposure doses tends to converge, and all the errors in said second approximate optimal exposure doses are found within a predetermined value.

According to the invention defined in Claim 1 as currently amended, standard irradiation duty cycle data for each of plural charged particle beams, plural pieces of proximity effect correction data for reducing proximity effect influence, and calibration data to reduce proximity effect influence are stored. One piece of proximity effect correction data for correction of stored irradiation duty standard data is selected from plural pieces of proximity effect correction data according to the condition of the object on each of irradiated positions by a computing device. The irradiation duty of each of plural charged particle beams is calibrated for each of the charged particle beams by the stored calibration data to generate pattern drawing data.

Muraki et al. may disclose charged beam exposure apparatus in which plural charged particle beams irradiate an object based on drawing data to draw a pattern on an object. As recognized by the Examiner, Muraki et al. does not teach proximity effect correction data or the use of a computing device to correct irradiation duty cycle standard data according to the proximity effect correction data. Accordingly, it is not seen that Muraki et al. teaches or suggests in any manner storing proximity effect correction data and selecting one proximity effect correction data to correct irradiation duty cycle standard data for calibration of plural charged beam particles as in Claim 1.

Abe et al. may teach calibrating data for irradiation does variations. As clearly disclosed

at least at lines 41 through 47 of column 20 that "During the transfer of data, the pattern data in the buffer memory 1 are sent to pattern data memory 1 (pattern data memory 2) and, at the same time, to proximity effect correcting circuit. The proximity effect correcting circuit calculates the correcting exposure dose for each region from the input pattern data and the result of calculation is sent to and stored in exposure dose data memory 1." There is, however, no teaching or suggestion in Abe et al. of storing plural pieces of proximity effect correction data or selecting one piece of proximity effect correction data from the plural pieces of proximity effect correction data in accordance with a condition of an wafer on each irradiation position in case of generating a drawing data. Accordingly, it is not seen that Abe et al. in any way suggests the storing pieces of proximity effect correction data combined with selecting one of the pieces of proximity effect correction data to correct irradiation duty cycle standard data as in Claim 1.

With regard to the cited combination, Muraki et al. only teaches a charged particle beam exposure apparatus using plural charged particle beams but is devoid of any disclosure of storing proximity effect correction data or using the proximity effect correction data to correct irradiation duty cycle standard data. Abe et al. is devoid of any disclosure of storing plural pieces of proximity effect correction data combined with selecting one piece of proximity effect correction data from the plural pieces of proximity effect correction data in accordance with a condition of an wafer in a case of generating a drawing data. As a result, it is not seen that the addition of Abe et al.'s disclosure of calculation of correcting exposure dose data that fails to suggest selecting one piece of proximity effect correction data according to object condition on each irradiation position to correct irradiation cycle standard data to Muraki et al.'s use of plural

charged particle beams in a charged particle exposure apparatus devoid of any suggestion of proximity effect correction data could possibly suggest a computing device that corrects irradiation cycle standard data with one piece of proximity effect correction data selected from plural pieces of proximity effect correction data for each of plural irradiated positions to calibrate irradiation duty cycle of plural charged particle beams according to variation reducing particle beam calibration data as in Claim 1. Accordingly, it is believed that Claim 1 as currently amended is completely distinguished from any combination of Muraki et al. and Abe et al. and is allowable.

For the foregoing reasons, Applicants submit that the present invention, as recited in independent claim 1, also is patentably defined over the cited art.

Dependent claims 2-6 also should be deemed allowable, in their own right, for defining other patentable features of the present invention in addition to those recited in independent claim 1. Further individual consideration of these dependent claims is requested.

Applicants further submit that this Amendment After Final Action clearly places this application in condition for allowance. This Amendment was not earlier presented because Applicants believed that the prior Amendment placed the application in condition for allowance. Accordingly, entry of the instant Amendment, as an earnest attempt to advance prosecution and reduce the number of issues, is requested under 37 CFR 1.116.

Favorable reconsideration, withdrawal of the rejection set forth in the above-noted Office Action and an early Notice of Allowance are also requested.

Applicants' attorney, Steven E. Warner, may be reached in our Washington, D.C. office by telephone at (202) 530-1010. All correspondence should be directed to our address listed below.

Respectfully submitted,

Jack S. Cubert

Attorney for Applicants
Jack S. Cubert
Registration No. 24,245

FITZPATRICK, CELLA, HARPER & SCINTO
30 Rockefeller Plaza
New York, New York 10112-3800
Facsimile: (212) 218-2200
SEW/JSC/dc

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